TABLE 2-1
AVERAGE ANNUAL TOTAL MERCURY AND TOTAL SUSPENDED SOLIDS SOURCE LOADS FOR WY2000-2003 AND WY1984-2003

Inputs	Water Years 2000 to 2003				Water Years 1984 to 2003			
	Total Mercury		Total Suspended Solids		Total Mercury		Total Suspended Solids	
Delta Tributary Inputs	**kg/yr**	**% of All Inputs**	**Mkg/yr**	**% of All Inputs**	**kg/yr**	**% of All Inputs**	**Mkg/yr**	**% of All Inputs**
Sacramento River	146	67	689	59	183	46	866	37
Prospect Slough	36	16	273	23	162	41	1,190	51
San Joaquin River	19	8	146	13	30	7.6	235	10
Calaveras River	4	1.6	14	1.2	4	1.0	15	0.7
Mokelumne-Cosumnes River	3	1.5	9	0.7	4	1.1	11	0.5
Ulatis Creek	2	0.9	15	1.3	2	0.53	16	0.7
French Camp Slough	2	0.73	2	0.20	2	0.43	2	0.10
Morrison Creek	1	0.38	5	0.39	1	0.23	5	0.20
Marsh Creek	1	0.25	1	0.04	1	0.14	1	0.02
Bear/Mosher Creeks	0	0.13	2	0.19	0	0.07	2	0.10
Within-Delta Sources								
Wastewater (Municipal & Industrial)	2	1.1			2	0.61		
Urban	3	1.1	8	0.69	3	0.66	8	0.4
Atmospheric (Indirect)	1	0.64			2	0.38		
Atmospheric (Direct)	1	0.41			1	0.22		
Total Inputs	221	100	1,164	100	397	100	2,351	100

Source: California Regional Water Quality Control Board—Central Valley Region 2008, Table 7.1

kg = kilogram MKg = million kilogram

kg/yr = kilogram per year MKg/yr = million kilogram per year

TABLE 2-2
SACRAMENTO BASIN TRIBUTARY AVERAGE ANNUAL TOTAL MERCURY LOAD AND TOTAL MERCURY TO TOTAL SUSPENDED SOLIDS RATIO

Tributary	Average Annual Total Hg Load (kg)	% of Total Hg Inputs	Total Hg/TSS Ratio (mg/kg)
Sacramento River @ Colusa	152	36.5	0.10
Colusa Basin Drain	11	2.6	0.09
Feather River	76	18.2	0.30
Sutter Bypass	30	7.2	0.14
Cache Creek Settling Basin	119	28.5	0.46
Natomas East Main Drain	2	0.5	0.65
American River	14	3.4	0.27
Putah Creek	13	3.1	0.64

Source: California Regional Water Quality Control Board—Central Valley Region 2008, Tables 7.5 and 7.17
Hg = mercury
kg = kilogram
mg/kg = milligram per kilogram
TSS = total suspended solids

TABLE 3-1
TOTAL MERCURY AND TOTAL SUSPENDED SOLIDS IN DELTA TRIBUTARIES

Delta Tributary	Total Hg (kg/year)	Percent of Total Hg	TSS (Mkg/year)	Total Hg/TSS Ratio (mg/kg)	Comments
Sacramento River	183 ±1	46	866 ±7	0.21	Sacramento Basin
Prospect Slough	162 ±9	41	1,190 ±87	0.16	Sacramento Basin
San Joaquin River	30 ±4	7.6	235 ±39	0.13	San Joaquin Basin
Calaveras River	4	1.0	15.3	0.25	Direct Delta Tributary
Mokelumne-Cosumnes River	4±1	1.1	11. ±3	0.35	Direct Delta Tributary
Ulatis Creek	2	0.53	16	0.11	Direct Delta Tributary
French Camp Slough	2	0.43	2	0.32	Direct Delta Tributary
Morrison Creek	1	0.23	5	0.16	Direct Delta Tributary
Marsh Creek	1 ±0	0.14	1 ±1	0.47	Direct Delta Tributary
Bear/Mosher Creeks	0	0.07	2	0.12	Direct Delta Tributary

Source: California Regional Water Quality Control Board—Central Valley Region 2008, Tables 7.1 and 7.17
Hg = mercury
mg/kg = milligram per kilogram
Mkg = million kilograms
TSS = total suspended solids

TABLE 3-2
TOTAL MERCURY AND TOTAL SUSPENDED SOLIDS
IN SACRAMENTO BASIN TRIBUTARIES

Tributary	Average Annual Total Hg Load ± 95 CI (kg)	Percent of Sacramento Basin Total Hg Inputs	Total Hg/TSS Ratio (mg/kg)
Sacramento River at Colusa	152 ±4	36.5	0.10
Colusa Basin Drain	11 ±0	2.6	0.09
Feather River	76 ±2	18.2	0.30
Sutter Bypass	30	7.2	0.14
Cache Creek Settling Basin	119 ±5	28.5	0.46
Natomas East Main Drain	2	0.5	0.65
American River	14 ±0	3.4	0.27
Putah Creek	13 ±11	3.1	0.64

Source: California Regional Water Quality Control Board—Central Valley Region 2008,Tables 7.5 and 7.17
CI = confidence interval
Hg = mercury
kg = kilogram
mg/kg = milligram per kilogram
TSS = total suspended solids

TABLE 3-3
POTENTIAL PROJECT AREAS

Watershed	Average Annual Total Hg Load (kg/year)	Total Hg/TSS Ratio	Potential Mercury Sources	Potential Project Areas
Feather River watershed	76 ±2	0.30	Yuba and Bear River, flood plain and channel sediments from historic mining, reservoirs, point sources above reservoirs	• Significant point sources (if any) above reservoirs • Active channel and floodplain of Feather River near confluence with Yuba River • Active channel and floodplain of Feather River near confluence with Bear River • Active channel and floodplain of Feather River from Nicolaus to Verona • Active channel and floodplain of Feather River near confluence with Sacramento River
Yuba River watershed	42.91	0.30	Flood plain and channel sediments from historic mining, reservoirs, point sources above reservoirs	• Significant point sources (if any) above reservoirs • South Fork Yuba River at Englebright Reservoir • Active channel and floodplain of Feather River near confluence with Yuba River
Bear River watershed	8.97	0.44	Flood plain and channel sediments from historic mining, reservoirs, point sources above reservoirs	• Significant point sources (if any) above reservoirs • Camp Far West Reservoir • The active channel and floodplain from Camp Far West Reservoir to the confluence with the Feather River • Vicinity of the confluence with the Feather River
Cache Creek watershed	119 ± 5	0.46	Flood plain and channel sediments from historic mining, erosion of naturally mercury enriched soils, inactive mercury mines, hydrothermal springs,	• Mercury mines in Sulphur Creek watershed • Floodplain containing mine waste on Sulphur Creek and Bear Creeks • Floodplain containing mine waste on Harley Gulch • Active channel and floodplain on Lower Cache Creek from Capay to Yolo • Cache Creek Settling Basin
Putah Creek watershed	13 ± 11	0.64	Flood plain and channel sediments from historic mining, erosion of naturally mercury enriched soils, inactive mercury mines, hydrothermal springs, reservoirs, point sources above reservoirs	• Significant point sources (if any) above Lake Berryesa • The active channel and floodplain from Lake Berryesa to the Yolo Bypass • Mouth of Putah Creek at the Yolo Bypass
American River watershed	14 ± 0	0.27	Flood plain and channel sediments from historic mining, reservoirs, point sources above reservoirs	• Significant point sources (if any) above reservoirs • Lake Natomas and/or Folsom Lake • The active channel and floodplain from Lake Natomas to the confluence with the Sacramento River • Vicinity of the confluence with the Sacramento River
Yolo Bypass	162 ± 9	0.16	Suspended sediment from Cache Creek Settling Basin, Sacramento River, Feather River, and Putah Creek	• Yolo Bypass at confluence of Sacramento and Feather Rivers • Yolo Bypass at outlet of Cache Creek Settling Basin • Yolo Bypass at Putah Creek
Sacramento River	183 ± 1	0.21	In-stream sediment deposits, flood plain sediment deposits, sediment from American River, Feather River, and Natomas East Main Drain	• Active channel and floodplain of Sacramento River from Verona to Freeport, including confluence with American River

Data Source: California Regional Water Quality Control Board—Central Valley Region, 2008
Hg = mercury
Kg/yr = kilogram per year
TSS = total suspended solids

TABLE 3-4
PROJECT AREAS RETAINED FOR DETAILED EVALUATION

Watershed	Average Annual Total Hg Load (kg/year)	Total Hg/TSS Ratio	Retained Project Areas
Feather River	76 ±2	0.30	• Active channel and floodplain of Feather River near confluence with Yuba River • Active channel and floodplain of Feather River near confluence with Bear River • Active channel and floodplain of Feather River from Nicolaus to Verona • Active channel and floodplain of Feather River near confluence with Sacramento River
Yuba River	42.91	0.30	• South Fork Yuba River at Englebright Reservoir • Active channel and floodplain of Feather River near confluence with Yuba River
Cache Creek	119 ±5	0.46	• Mercury mines in Sulphur Creek watershed • Floodplain containing mine waste on Sulphur Creek and Bear Creeks • Floodplain containing mine waste on Harley Gulch • Active channel and floodplain on Lower Cache Creek from Capay to Yolo • Cache Creek Settling Basin
Yolo Bypass	162±9	0.16	• Yolo Bypass at confluence of Sacramento and Feather Rivers • Yolo Bypass at outlet of Cache Creek Settling Basin • Yolo Bypass at Putah Creek
Sacramento River	183±1	0.21	• Active channel and floodplain of Sacramento River from Verona to Freeport, including confluence with American River

Data Source: California Regional Water Quality Control Board—Central Valley Region, 2008
Hg = mercury
Kg/yr = kilogram per year
TSS = total suspended solids

TABLE 4-1a
GENERAL RESPONSE ACTIONS, CONTROL ACTIONS, AND PROCESS OPTIONS FOR LAND BASED SOURCE AREAS

General Response Action	Control Action	Process Option
No Action	None	None
Institutional Controls	Land and Water Use Restrictions, Ensure Implementation of BMPs	Institute zoning, deed restrictions, or easements to limit disturbance of and exposure to mine waste. Ensure use of soil conservation, tillage, crop cover BMPs to limit disturbance of land that received outwash from hydraulic mining. Institute water use restrictions to control exposure to mine related waste.
Engineering Controls	Surface Controls	Revegetation to control erosion
		Grading to control runoff and erosion
		Consolidation of mine waste and/or settling basin sediments
		Run-on and runoff controls/diversions
		Erosion/flood controls
	Containment	Earthen cover over mine waste
		Check dams to capture solids from mine site
		Settling basins to capture solids from mine site
		Levees to isolate mine waste from creek, streams, and rivers
	Excavation and Disposal	Placement of non-hazardous solids or processed fines under an earthen cover
		Placement of hazardous solids or processed fines in an on-site engineered repository (Group A or B)
		Placement of non-hazardous solids or processed fines in an off-site solid waste landfill
		Placement of hazardous solids or processed fines in an off-site Class I repository
Excavation and Treatment of Solids	Physical Separation	On-site physical separation of aggregate from fines and on- or off-site disposal of processed fines
	Physical/Chemical Treatment	On-site physical separation of aggregate from fines and off-site retorting of processed fines
		On-site physical separation of aggregate from fines and fixation/stabilization of processed fines
		On-site physical separation of aggregate from fines and soil washing of processed fines
In-Place Treatment of Solids	Physical/Chemical Treatment	Soil Flushing
		Fixation/Stabilization

BMP = Best management practice
NPDES = National Pollutant Discharge Elimination System

TABLE 4-1b
GENERAL RESPONSE ACTIONS, CONTROL ACTIONS, AND PROCESS OPTIONS FOR STREAM BASED SOURCE AREAS

General Response Action	Control Action	Process Option
No Action	None	None
Institutional Controls	Ensure Implementation of Existing Programs	Community mercury recovery, coordination of river dredging, promote recreational dredging of in stream sediments
	Improve Operation and Maintenance Activities	Flood control levee maintenance, reservoir storage and release management, coordinate flood and irrigation management activities to improve off stream storage and solids settling, operate flood control system to improve solids settling
Engineering Controls	Surface Controls	Improve efficiency of existing sediment control structures
		Stabilization of stream banks, flood plains, and settling basin surface
		Stabilization of Delta marshlands and unprotected Delta islands
	Containment	Cap/cover lake and settling basin sediments
		Flow diversion to new bypass to promote solids settling
		Flow diversion to new settling basin to promote solids settling
		Containment of flood flows within new levees to limit entrainment of historic floodplain sediment
		Capture sediment using low dams and weirs within small creeks and streams
		Cleaning and grouting floor of hydraulic mine drainage tunnels
		Plugging of hydraulic mine sluices and drainage tunnels
	Dredging and Disposal	Placement of dredge material or processed fines on farmland or Delta islands with control levees
		Placement of dredge material or processed fines as fill for construction
		Placement of dredge material or processed fines in a solid waste landfill
		Placement of dredge material or processed fines in a Class I repository
Dredging and Treatment of Sediment	Physical Separation	Physical separation of aggregate from fines and disposal of fines on farmland or Delta islands with control levees or as construction fill material
	Physical/Chemical Treatment	Physical separation of aggregate from fines and off-site retorting of processed fines
		Physical separation of aggregate from fines and fixation/stabilization of processed fines
		Physical separation of aggregate from fines and soil washing of processed fines

TMDL = Total Maximum Daily Load

TABLE 4-2a
CONTROL ACTION SCREENING COMMENTS SUMMARY FOR
LAND BASED SOURCE AREAS
(Page 1 of 4)

General Response Action	Control Action	Process Option	Description	Screening Comment
No Action	None	None	No action.	Allows continued release of sediments containing mercury from point and non-point sources to the Delta watershed.
Institutional Controls	Land and Water Use Restrictions, Ensure Implementation of BMPs	Institute land and water use restrictions; ensure implementation of existing BMPs.	Institute zoning, deed restrictions, or easements to limit disturbance of and exposure to mine waste. Ensure use of soil conservation, tillage, crop cover BMPs to limit disturbance of land that received outwash from hydraulic mining. Institute water use restrictions to control exposure to mine related waste.	Reduces erosion and sediment loading at all scales within existing programs. Low to moderately effective, depending on degree of implementation. Easily implementable, though land use restrictions are expected to meet some resistance. Timeframe to achieve load reduction is short to moderate term. Primarily addresses mercury stored in soils on old floodplains. Provides relatively low load reduction in system overall, though over time reduces buildup of mercury mass in river system sediment. Implementation of water use restrictions is of limited use as most of the mercury loading concern is through bioaccumulation within the food chain rather than direct water ingestion.
Engineering Controls	Surface Controls	Revegetation to control erosion	Add soil amendments to disturbed areas and seed and/or plant cover crops, brush, and trees to reduce erosion of sediment from mine waste, active floodplains (no levees), and floodplains that received outwash from historic hydraulic mining.	Reduces erosion and sediment loading at all scales from mine reclamation to floodplain stabilization. Moderately effective. Easily implementable. Timeframe to achieved load reduction is moderate to long term due to time to establish sufficient cover. Primarily addresses mercury contained in actively eroding mine waste and sediment originated from mining; though could be used to stabilize diffuse mercury stored in active floodplains. Provides relatively low to moderate load reduction depending on scale of project.
		Grading to control run off and erosion	Grade disturbed mine features and waste, stream banks, and active floodplains (no levees) to manage surface water infiltration, run off, and erosion.	Reduces erosion and sediment loading at all scales from mine reclamation to floodplain stabilization. Low to moderately effective. Easily implementable at mine remediation sites, but becomes difficult at larger scales due to disturbance of intact vegetation. Timeframe to achieved load reduction is short term for small-scale projects, and moderate to long term for large-scale projects due to time for establishment of sufficient cover over newly disturbed soils. Primarily addresses mercury contained in actively eroding mine waste and sediment originated from mining; though could be used to stabilize diffuse mercury stored in active floodplains. Provides relatively low to moderate load reduction depending on scale of project.
		Consolidation of mine waste and/or settling basin sediments	Combine similar mine waste types or sediments with similar mercury concentrations in a common location for revegetation, covering, or engineered containment.	Reduces area available for erosion at a small scale, primarily at mine reclamation sites. Limited effectiveness as soil and sediment are still subject to erosion. Needs to be combined with other control action to improve effectiveness. Easily implementable. Timeframe to achieved load reduction is over the short term. Addresses mercury contained in actively eroding mine waste. Provides relatively low load reduction to system as a whole; though would provide a moderate load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).
		Run-on and run-off controls/diversions	Install berms, drainage bars, drainage ditches, and swales to divert storm water around mine waste and to collect run off from mine waste.	Reduces erosion and sediment loading at a small scale, primarily at mine reclamation sites. Moderately effective. Easily implementable. Timeframe to achieved load reduction is over the short term. Addresses mercury contained in actively eroding mine waste. Provides relatively low load reduction to system as a whole; though would provide a moderate load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).
		Erosion/flood controls	Manage flood flows using box culverts, rock falls, and dry dams to reduce the erosive force of water within and adjacent to mine waste. In-channel energy dissipation measures may include rock armoring of banks, wing dams, and widening of channel upstream and through mine waste.	Reduces erosion and sediment loading at a small scale, primarily at mine reclamation sites. Moderately effective. Easy to moderate implementablity, depending on degree of stream channel modification. Timeframe to achieved load reduction is over the short term. Addresses mercury contained in actively eroding mine waste and floodplain deposits. Provides relatively low load reduction to system as a whole; though would provide a moderate to high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).
	Containment	Earthen cover over mine waste	Apply inert waste, overburden, soil, or sediment over intact mine waste containing elevated concentrations of mercury; grade to control run off; divert high velocity flows; establish vegetative cover to stabilize surface.	Eliminates mine waste available for erosion at a small scale, primarily at mine reclamation sites. Moderately effective. Easily implementable at mine sites. Timeframe to achieve load reduction is over the short term. Addresses mercury contained in actively eroding mine waste. Provides relatively low load reduction to system as a whole; though projects at mine sites would provide a moderate to high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).

TABLE 4-2a
CONTROL ACTION SCREENING COMMENTS SUMMARY FOR
LAND BASED SOURCE AREAS

General Response Action	Control Action	Process Option	Description	Screening Comment
Engineering Controls (continued)	Containment (continued)	Check dams to capture solids from mine site	Construct one or more check dams down stream of mine site(s) to promote settling of solids from storm water run off. Requires periodic removal of accumulated sediment and placement back at mine site or off-site disposal in a solid waste landfill or Class I repository, depending on mercury concentration.	Captures predominately medium to coarse grained sediment and reduces sediment loading at a small scale, primarily downstream of mine reclamation sites. Moderately to highly effective, depending on size of basin behind check dam. Easy to moderate implementablity, depending on size of structure. Timeframe to achieved load reduction is over the short term. Requires frequent excavation and disposal of sediment. Captures mercury from actively eroding mine waste before it disperses throughout the watershed and degrades downstream water quality. Provides relatively low load reduction to system as a whole; though would provide a moderate to high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins). Potential for generation of methyl mercury in sediments retained behind check dam.
		Settling basins to capture solids from mine site	Construct on- or off-stream settling basin down stream of mine site(s) to promote settling of solids from storm water run off. Requires periodic removal of accumulated sediment and placement back at mine site or off-site disposal in a solid waste landfill or Class I repository, depending on mercury concentration.	Captures more size fractions of sediment than check dam and reduces sediment loading at a small scale, primarily downstream of mine reclamation sites. Moderately to highly effective, depending on size of settling basin. Easy to moderate implementablity, depending on available space and retention structure size. Timeframe to achieved load reduction is over the short term. Eventually will require excavation and disposal of sediment. Addresses mercury from actively eroding mine waste before it disperses throughout the watershed and can degrade downstream water quality. Provides relatively low load reduction to system as a whole; though would provide high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins). Potential for generation of methyl mercury in sediments retained in settling basin.
		Levees to isolate mine waste from creek, streams, and rivers	Construct set back levees to isolate mine waste on floodplain or adjacent to stream from active stream channel. Action is applicable where the volume of mine waste is too large to excavate and consolidate on-site or dispose of at an off-site facility.	Eliminates mine waste available for erosion at a small scale, primarily at mine reclamation sites. Highly effective. Easy to moderate implementablity, depending on degree of stream channel modification. Potential erosive force of floodwaters must be considered if floodplain is restricted. Timeframe to achieved load reduction is over the short term. Addresses mercury contained in actively eroding mine waste. Provides relatively low load reduction to system as a whole; though projects at mine sites would provide high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).
	Excavation and Disposal	Placement of non-hazardous solids or processed fines under an earthen cover	Excavate mine waste, settled solids, or floodplain deposits containing elevated concentrations of mercury; backfill excavation with inert material and/or grade to control run off; divert high velocity flows; establish vegetative cover to stabilize surface. Consolidate non-hazardous excavated materials or processed fine materials in one location; apply inert waste, overburden, soil, or sediment over non-hazardous excavated materials or processed fine materials; grade to control run off; divert high velocity flows; establish vegetative cover to stabilize surface.	Eliminates mine waste available for erosion at a small scale, primarily at mine reclamation sites. Highly effective. Easily implementable at mine sites. Not cost effective to excavate, consolidate, and cover large volume of non-hazardous solids from non-mine related areas. Timeframe to achieved load reduction is over the short term. Addresses mercury contained in actively eroding mine waste and floodplain deposits containing mine related sediment. Provides relatively low load reduction to system as a whole; though projects at mine sites would provide high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).
		Placement of hazardous solids or processed fines in an on-site engineered repository (Group A or B)	Excavate mine waste, settled solids, or floodplain deposits containing elevated, hazardous concentrations of mercury; backfill excavation with inert material and/or grade to control run off; divert high velocity flows; establish vegetative cover to stabilize surface. Consolidate excavated materials or processed fine materials in one location in an engineered Group A (untreated hazardous materials) or Group B (low hazard, treated materials) mine waste repository; grade to control run off; divert high velocity flows; establish vegetative cover to stabilize surface.	Eliminates mine waste available for erosion at a small scale, primarily at mine reclamation sites. Highly effective. Not readily implementable at individual mine sites due restrictive construction and siting requirements; also not cost effective unless a large volume of hazardous solids requires containment. Timeframe to achieved load reduction is over the short term. Addresses mercury contained in actively eroding mine waste and floodplain deposits containing mine wastes. Provides relatively low to moderate load reduction to system as a whole by removing high concentrations of mercury; though projects at mine sites would provide high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).

TABLE 4-2a
CONTROL ACTION SCREENING COMMENTS SUMMARY FOR
LAND BASED SOURCE AREAS

General Response Action	Control Action	Process Option	Description	Screening Comment
Engineering Controls (continued)	Excavation and Disposal (continued)	Placement of non-hazardous solids in an off-site solid waste landfill	Excavate non-hazardous mine waste, settled solids, or floodplain deposits containing elevated concentrations of mercury; backfill excavation with inert material and/or grade to control runoff; divert high velocity flows; establish vegetative cover to stabilize surface. Haul non-hazardous materials (mercury content below 20 mg/kg) to and place in an off-site state regulated solid waste landfill.	Eliminates mine waste available for erosion at a small scale, primarily at mine reclamation sites. Highly effective. Easily implementable at mine sites. Not cost effective to excavate and transport a large volume of non-hazardous solids from non-mine related areas. Timeframe to achieved load reduction is over the short term. Addresses mercury contained in actively eroding mine waste and floodplain deposits containing mine related sediment. Provides relatively low load reduction to system as a whole; though projects at mine sites would provide high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).
		Placement of hazardous solids in an off-site Class I repository	Excavate mine waste, settled solids, or floodplain deposits containing elevated, hazardous concentrations of mercury; backfill excavation with inert material and/or grade to control run off; divert high velocity flows; establish vegetative cover to stabilize surface. Haul hazardous materials (mercury content between 20 mg/kg and 260 mg/kg) to and place in an off-site Class I repository for hazardous materials.	Eliminates mine waste available for erosion at a small scale, primarily at mine reclamation sites. Highly effective. Easily implementable at mine sites. Timeframe to achieved load reduction is over the short term. Addresses mercury contained in actively eroding mine waste and floodplain deposits containing mine related sediment. Provides relatively low to moderate load reduction to system as a whole by removing high concentrations of mercury; though projects at mine sites would provide high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).
Excavation and Treatment of Solids	Physical Separation	On-site physical separation of aggregate from fines and on- or off-site disposal of processed fines	Excavate mine waste, settled solids, or floodplain deposits containing elevated concentrations of mercury; backfill excavation with inert material and/or grade to control run off; divert high velocity flows; establish vegetative cover to stabilize surface. Mobilize batch sand and gravel plant setup for mercury recovery. Separate coarse material from fine materials containing mercury. Return coarse fraction to excavation or sell aggregate as a commodity. On- or off-site disposal of fine materials as a non-hazardous material (mercury content below 20 mg/kg) or as a hazardous material (mercury content between 20 mg/kg and 260 mg/kg) in an off-site Class I landfill.	Eliminates mine waste available for erosion at a small to medium scale, primarily at mine reclamation sites and mine related floodplain deposits containing elevated concentrations of mercury. Highly effective. Easily implementable at mine sites, would require bulk soil transport to a centralized facility for multiple mine sites or floodplain reclamation. Disposal of fine materials as non-hazardous material and disposal of hazardous fine materials required. Timeframe to achieved load reduction is over the short term at mine sites; and medium term for floodplain deposits due to longer processing time. Addresses mercury contained in actively eroding mine waste and floodplain deposits containing mine related sediment. Provides relatively low to moderate load reduction to system as a whole by removing high concentrations of mercury; provides high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).
	Physical/Chemical Treatment	On-site physical separation of aggregate from fines and off-site retorting of processed fines	See "On-site physical separation of aggregate from fines" Transport fine materials containing hazardous concentrations of mercury above 260 mg/kg that cannot be disposed of in a Class I landfill, to an off-site permitted retorting facility. Retort process volatilizes mercury from processed fines by heating of material. Mercury vapor is collected, recondensed, and sold as an economic commodity.	Eliminates mine waste available for erosion at a small to medium scale, primarily at mine reclamation sites and mine related floodplain deposits containing elevated concentrations of mercury. Highly effective. Easily implementable at mine sites, would require transport to a centralized facility for multiple mine sites or floodplain reclamation. Timeframe to achieved load reduction is over the short term at mine sites; and medium term for floodplain deposits due to longer processing time. Addresses mercury contained in actively eroding mine waste and mine related floodplain deposits. Provides relatively low to moderate load reduction to system as a whole by removing high concentrations of mercury; provides high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).
		On-site physical separation of aggregate from fines and fixation/stabilization of processed fines	See "On-site physical separation of aggregate from fines" Fixation/stabilization can be used as a pretreatment process to limit the leachability of mercury prior to disposal of excavated non-hazardous fine materials on site or hazardous fine materials in an off-site waste repository (addresses leachability concern for disposal in Class II landfill). Uses solidifying/ stabilizing agents in conjunction with mixing techniques to facilitate a physical or chemical change in mobility of the mercury.	Eliminates mine waste available for erosion at a small to medium scale, primarily at mine reclamation sites and mine related floodplain deposits containing elevated concentrations of mercury. Highly effective. Easily implementable at mine sites, would require bulk soil transport to a centralized facility for multiple mine sites or floodplain reclamation. Fixation/stabilization of fine materials should be considered where leachability of mercury from fines would otherwise preclude disposal in a Class II versus a more restrictive Class I landfill. Timeframe to achieved load reduction is over the short term at mine sites; and medium term for floodplain deposits due to longer processing time. Addresses mercury contained in actively eroding mine waste and floodplain deposits related to mining. Provides relatively low to moderate load reduction to system as a whole by removing high concentrations of mercury; provides high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).

TABLE 4-2a
CONTROL ACTION SCREENING COMMENTS SUMMARY FOR
LAND BASED SOURCE AREAS

General Response Action	Control Action	Process Option	Description	Screening Comment
Excavation and Treatment of Solids (continued)	Physical/Chemical Treatment (continued)	On-site physical separation of aggregate from fines and soil washing of processed fines	See "On-site physical separation of aggregate from fines" Soil washing would be used to separate metals from processed fine materials via dissolution in a heap, vat, or agitated vessel followed by precipitation in a separate vessel.	Eliminates mine waste available for erosion at a small to medium scale, primarily at mine reclamation sites and floodplain deposits containing elevated concentrations of mercury. Excavation and physical separation are highly effective; however, washing of processed fines has limited effectiveness at removing low to moderate concentrations of mercury from soil. Excavation and physical separation process is easily implementable at mine sites, would require bulk soil transport to a centralized facility for multiple mine sites or floodplain reclamation. However, soil washing process would require construction of a large plant to remove mercury from fines. Also, may still require disposal of fines in a landfill if process is not effective. Timeframe to achieved load reduction is over the short term at mine sites; and medium term for floodplain deposits due to longer processing time. Addresses mercury contained in actively eroding mine waste and floodplain deposits related to mining. Provides relatively low to moderate load reduction to system as a whole by removing high concentrations of mercury; provides high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).
In Place Treatment of Solids	Physical/Chemical Treatment	Soil Flushing	Acid/base reagent or chelating agent injected into solid media to solubilize mercury; solubilized mercury and reagents are subsequently extracted using dewatering techniques.	Potentially reduces mercury concentration in near surface mine waste available for erosion at a small scale, primarily at mine reclamation sites. Requires groundwater extraction and treatment to recover mercury leached from mine waste. In situ soil flushing may have moderate effectiveness where hydraulic conductivity is good; however, poorly structured mine waste typically contains a large amount of fines which would limit effectiveness at removing low to moderate concentrations of mercury from soil. In situ soil flushing process is difficult to implement due to the large number of injection and extraction points necessary to achieve hydraulic control and leachate capture. Timeframe to achieved load reduction is over the short term at mine sites; however, mine waste may still require excavation and disposal in a landfill if process is not effective. Addresses mercury contained in mine waste. Provides relatively low to moderate load reduction to system as a whole by removing high concentrations of mercury; provides high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).
		Fixation/Stabilization	Stabilize mercury in place by injected stabilizing agents into solid media to facilitate a physical or chemical change in mobility of the contaminants.	Potentially reduces mercury concentration in near surface mine waste available for erosion at a small scale, primarily at mine reclamation sites. Requires dense array of injection points to fix mercury in place. In situ fixation/stabilization may have moderate effectiveness where hydraulic conductivity is good; however, poorly structured mine waste typically contains a large amount of fines which would limit effectiveness at introducing reagents. In situ fixation/stabilization process is difficult to implement due to the large number of injection points necessary to distribute reagents. Timeframe to achieved load reduction is over the short term at mine sites; however, mine waste may still require excavation and disposal in a landfill if process is not effective. Addresses mercury contained in mine waste. Provides relatively low to moderate load reduction to system as a whole by removing high concentrations of mercury; provides high load reduction in specific sub-basins and could reduce scale of down stream projects (for example, settling basins).

Notes: Eliminated control actions and/or process options are shaded.
BMP = Best management practice
mg/kg = milligram per kilogram

TABLE 4-2b
CONTROL ACTION SCREENING COMMENTS SUMMARY FOR
STREAM BASED SOURCE AREAS

General Response Action	Control Action	Process Option	Description	Screening Comment
No Action	None	None	No action.	Allows natural flushing of sediments through and gradual attenuation of mercury from the system. No short-term change to mercury concentration in the Bay-Delta.
Institutional Controls	Ensure Implementation of Existing Programs	Community mercury recovery, coordination of river dredging, promote recreational dredging of in stream sediments	Support community mercury recovery; coordination of river dredging activities with other agencies to ensure that sediments containing mercury are removed, placed, and maintained in such a manner as to reduce migration back into the river system; promote recreational dredging of elemental mercury from stream sediments downstream of mining districts and buy back of mercury as a commodity.	Removes existing mercury from system above reservoirs and prevents reintroduction of mercury to system within existing programs. Low to moderately effective, depending on degree of implementation. Easily implementable. Timeframe to achieve load reduction is long term. Primarily addresses mercury stored in stream sediments. Provides relatively low load reduction in system overall, though over time reduces buildup of mercury mass in river system sediment.
	Improve Operation and Maintenance Activities	Flood control levee maintenance, reservoir storage and release management, coordinate flood and irrigation management activities to improve off-stream storage and solids settling, operate flood control system to improve solids settling	Continue maintenance of smaller levee systems to limit bank and floodplain erosion, coordinate reservoir storage and release management with other agencies to minimize discharge of suspended sediments and to reduce channel scour when feasible, coordinate flood and irrigation management activities with other agencies to improve off-stream storage and suspended solids settling during winter, operate flood control bypasses and basins to improve suspended solids settling during winter.	Reduces channel and floodplain erosion and in channel scour, improves settling of suspended sediment within existing structures during high flow and flood events when the majority of mercury is mobilized. Approach is applicable at local to regional scale. Moderately effective. Easily implementable. Timeframe to achieve load reduction is short term, primarily reducing mercury input from above reservoirs and reducing in channel load peaks during high flow events. Primarily addresses fine sediment entering upstream reservoirs and active channel sediment within lower system. Provides relatively moderate to high load reduction from active sediment, depending on scale of flood events, and low to moderate reduction of load entering lower system from reservoirs. May increase the wetting frequency/duration of off-stream land, providing an environment for mercury methylation.
Engineering Controls	Surface Controls	Improve efficiency of existing sediment control structures	Increase the size (area and/or depth) of existing settling basins and/or install additional flow control berms and weirs to increase hydraulic residence time with existing settling basins. Install flow control berms and weirs within existing flood control bypasses to improve sediment retention during flood events. Increase the height of existing debris and flood control structures to improve sediment retention during flood events. Requires periodic removal of accumulated sediment from settling basins to maintain hydraulic retention time required for settling of fines. Process sediment for aggregate and transport non-hazardous fines to and place on farmland protected by levees or use as fill at a construction site.	Reduces flood flow velocity and increases hydraulic residence time within settling basins and bypasses, and behind weirs and dams. Captures all sediment size fractions, including fines with extended hydraulic residence time. Applicable to all stream and river reaches and associated sediment control structures throughout system. Provides a moderate increase in the efficiency of existing sediment control structures. Easy to moderate implementability, depending on structure size and available space for expansion. Timeframe to achieved additional load reduction is over the short term, though majority of load reduction will occur during high flow and flood events. Provides relatively moderate increase in load reduction from existing structures to system as a whole. May increase the wetting frequency/duration of off-stream land and sediment behind structures, providing an environment for mercury methylation.
		Stabilization of stream banks, active flood plain surface, and settling basin surface	Alter channel geometry and/or install wing dams and rip rap to reduce erosion and lateral migration of stream into active and historic floodplain deposits containing elevated levels of mercury and mine waste. Lay back stream banks and grade active floodplains, containing elevated levels of mercury and mine waste, to reduce erosion during flood flows. Add soil amendments to and seed and/or plant cover crops, brush, and trees to reduce erosion of stream banks, active floodplain, and settling basin surfaces.	Reduces energy contributing to lateral migration of streams into and erosion of active and historic floodplains containing elevated levels of mercury from upstream mine sites; also reduces erosion of sediment from active floodplain and settling basin surfaces. Energy reduction applicable primarily to small to medium size, ephemeral to flashy streams; while grading and vegetative stabilization is applicable to all active floodplains and settling basins. Energy reduction actions are moderately effective, while grading and revegetation actions are moderately to highly effective. Energy reduction measures may be moderately difficult to implement, depending on size of stream and amount of channel alteration; while grading and revegetation measures are easily implementable. Timeframe to achieved load reduction is over the moderate term necessary for vegetation to stabilize currently eroding stream banks, floodplains, and settling basin surfaces. Provides relatively low to moderate load reduction to system as a whole; though would provide a moderate to high load reduction in specific sub-basins and could reduce scale of downstream projects (for example, settling basins). No net impact on potential for mercury methylation anticipated.

TABLE 4-2b
CONTROL ACTION SCREENING COMMENTS SUMMARY FOR
STREAM BASED SOURCE AREAS

General Response Action	Control Action	Process Option	Description	Screening Comment
Engineering Controls (continued)	Surface Controls (continued)	Stabilization of Delta marshlands and unprotected Delta islands	Stabilize marshes containing elevated levels of mercury through revegetation and increasing rate of sediment deposition. Construct hydraulic control levees around larger marshlands to increase hydraulic retention time and settling of fines. Place dredged channel sediment adjacent to marshlands to increase shoreline protection. Stabilize unprotected Delta islands (no levees) containing elevated levels of mercury through construction of reclamation levees. Place dredged channel sediment on reclaimed islands to stabilize toe of levees and to develop upland areas.	Reduces energy of water flowing through/over unprotected marshland and islands, provides environment for deposition of sediment to cover older sediment containing elevated level of mercury; protects margins of marshland and islands by reducing lateral migration of river. Applicable primarily to active lateral erosion areas on unprotected marshlands and island in the Delta. Highly effective at reducing erosion, captures sediment during high tide and flood events. Moderate to difficult implementablity, depending on length of levee system and hydraulic modifications. Control action should be combined with stream bank stabilization measures. Potential erosive force of floodwaters must be considered if floodplain is restricted. Timeframe to achieved load reduction is over the long term. Provides relatively low load reduction to system as a whole; the control action will not be carried forward for further evaluation. May increase the wetting frequency/duration of sediments captured in marshlands, providing an enhanced environment for mercury methylation.
	Containment	Cap/cover lake and settling basin sediments	Apply inert or low mercury concentration sediment over sediment containing elevated concentrations of mercury within existing foothill reservoirs and downstream settling basins. Divert high velocity flows in settling basin away from covered sediment. Capping or covering would reduce the entrainment of sediment containing elevated concentrations of mercury during flood events.	Limits erosion and/or entrainment of sediment containing elevated levels of mercury; reduces mercury available for methylation through isolation. Moderately effective. Moderately implementable for settling basins; moderate to difficult implementablity for reservoirs. Timeframe to achieve load reduction is over the short term. Addresses mercury contained in upper layer of mobile/erodible sediment. Provides relatively low load reduction to system as a whole; though would provide moderate methyl mercury load reduction in sub-basins. Integrity of cap/cover cannot be guaranteed due to erosive flood events in settling basins and potential exposure/down cutting during summer reservoir operations; therefore, the control action will not be carried forward for further evaluation.
		Flow diversion to new bypass to promote solids settling	Increase flood routing capacity and associated solids settling capacity through the construction of additional flood control bypasses. Requires construction of additional flood control levees on farmland and passive/active weirs at up and down stream ends. Install flow control berms and weirs within the flood control bypass to improve sediment retention during flood events.	Captures all sediment size fractions, including some fines where flow control weirs are added to slow down water velocity. Applicable to medium streams to large size rivers, primarily on the valley floor, where removal of heavy sediment loads during flood events is desired. Moderately effective, depending on velocity reduction and length of bypass. Moderate implementablity, due to need to construct long levees and the amount of farm land that will be placed under water during winter. Timeframe to achieved load reduction is over the moderate term as the majority of load is from sediment containing low mercury levels and the majority of load reduction will occur only during flood events. Residual levels of mercury in deposited sediment should be stabilized through crop cover. Provides relatively moderate load reduction to system as a whole. May increase the wetting frequency/duration of off-stream land, providing an environment for mercury methylation
		Flow diversion to new settling basin to promote solids settling	Construct additional off-stream settling basins to promote settling of solids during high flow and flood events. Requires construction of hydraulic control levees and passive/active weirs at up and down stream ends. Install flow control berms and weirs within the settling basin to improve sediment retention during flood events. Consideration should be given to construction of settling basins where streams exit foothills to help control downstream bank erosion. Requires periodic removal of accumulated sediment from settling basins to maintain hydraulic retention time required for settling of fines. Process sediment for aggregate and transport non-hazardous fines to and place on farmland protected by levees or use as fill at a construction site.	Captures all sediment size fractions, including fines with extended hydraulic residence time. Applicable to small to medium size streams, primarily downstream of mining districts where relatively high mercury loading occurs during high flow and flood events. Moderately to highly effective, depending on size of settling basin. Easy to moderate implementablity, depending on available space and levee and weir structure sizing. Timeframe to achieved load reduction is over the short term, though majority of load reduction will occur during high flow and flood events. Eventually will require excavation and disposal of sediment to maintain hydraulic residence time. Addresses mercury from mining districts before it disperses into main stem rivers. Provides relatively moderate load reduction to system as a whole. May increase the wetting frequency/duration of off-stream land, providing an environment for mercury methylation.

TABLE 4-2b
CONTROL ACTION SCREENING COMMENTS SUMMARY FOR
STREAM BASED SOURCE AREAS

General Response Action	Control Action	Process Option	Description	Screening Comment
Engineering Controls (continued)	Containment (continued)	Containment of flood flows within new levees to limit entrainment of historic floodplain sediment	Construct levees to isolate mercury and mine waste contained in floodplain sediment from adjacent active stream channel. Action is applicable where the volume of impacted sediment is too large to excavate and dispose of off-site.	Reduce exposure of active and historic floodplains containing elevated levels of mercury from upstream mine sites to stream erosion. Applicable primarily to active lateral erosion areas within and along small to medium size streams. Highly effective at reducing erosion. Easy to moderate implementablity, depending on degree of stream channel modification. Potential erosive force of floodwaters must be considered if floodplain is restricted. Timeframe to achieved load reduction is over the short term. Addresses mercury contained in actively eroding floodplain deposits containing mine waste. Provides relatively low to moderate load reduction to system as a whole; though would provide a moderate to high load reduction in specific sub-basins and could reduce scale of downstream projects (for example, settling basins). No net impact on potential for mercury methylation anticipated.
		Capture sediment using low dams and weirs within small creeks and streams	Install flood control and debris dams on smaller streams to capture sediment and to reduce energy contributing to the lateral migration of stream into active and historic floodplain deposits containing elevated levels of mercury and mine waste. Requires periodic removal of accumulated sediment from behind dams to maintain hydraulic retention time required for energy dissipation and settling of fines. Process sediment for aggregate and transport non-hazardous fines to and place on farmland protected by levees or use as fill at a construction site.	Reduces energy contributing to lateral migration of streams into and erosion of active and historic floodplains containing elevated levels of mercury from upstream mine sites. Applicable primarily to small to medium size, ephemeral to flashy streams. Captures predominately medium to coarse grained mobile sediment behind structure during high energy events and fine grained sediment at low to moderate flows. Control action should be combined with stream bank stabilization measures. Moderately to highly effective, depending on size of structure and sediment retention basin behind structure. Moderate to difficult implementablity, depending on size of structure. Timeframe to achieved load reduction is over the short term for retained sediment and moderate term for necessary stabilization of currently eroding stream banks. Requires relatively frequent removal and disposal of accumulated sediment. Provides relatively low to moderate load reduction to system as a whole; though would provide a moderate to high load reduction in specific sub-basins and could reduce scale of downstream projects (for example, settling basins). May increase the wetting frequency/duration of sediments contained behind structure in ephemeral creeks, providing an enhanced environment for mercury methylation.
		Plugging of hydraulic mine drainage tunnels	Plug inlets to hydraulic mine drainage tunnels to stop erosion of tunnel sediments containing mercury. Contour mine pit floor or install pipe to divert storm water to above ground drainage pathways.	Eliminates entry and movement of water through historic hydraulic mine drainage tunnels. Erosion and/or dissolution of mercury from tunnel sediment would be greatly reduced. Applicable primarily at small scale mine reclamation sites. Highly effective and easily implementable, though the mass of mercury remains within the drainage tunnel. Timeframe to achieve load reduction is over the short term. Addresses mercury contained in actively eroding and intact tunnel sediment. Provides relatively little discernable load reduction to system as a whole; though projects at mine sites could provide a moderate load reduction in specific sub-basins. Limited load reduction to lower river system as hydraulic mine sites are above foothill reservoirs. Potential high mercury concentration, but flow and load insignificant; therefore control action will not be carried forward for further evaluation. May reduce the wetting frequency/duration of sediments within and downstream of drainage tunnels, reducing the potential for mercury methylation.
		Cleaning and grouting floor of hydraulic mine sluices and drainage tunnels	Excavate and/or muck sediment from mine sluices, drainage tunnels, and plunge pools. After sediment removal, seal floor of sluice, drainage tunnel, and plunge pool to ensure that residual mercury in bedrock foliations is isolated. Backfill sealed sluices and establish vegetation to stabilize surfaces. See “Physical separation of aggregate from fines”	Removes sediment containing mercury from historic hydraulic mine drainage tunnels and reduces dissolution of mercury from tunnel host rock through isolation. Applicable primarily at small scale mine reclamation sites. Highly effective and easily implementable. Mercury contained in sediment is processed to reduce volume and retorted or placed in a landfill/repository depending on waste characteristics. Timeframe to achieve load reduction is over the short term. Addresses mercury contained in actively eroding and intact tunnel sediment. Provides relatively little discernable load reduction to system as a whole; though projects at mine sites could provide a moderate load reduction in specific sub-basins. Limited load reduction to lower river system as hydraulic mine sites are above foothill reservoirs. Potential high mercury concentration, but flow and load insignificant; therefore control action will not be carried forward for further evaluation. May reduce the potential for mercury methylation through mass reduction and isolation of residual mercury in host rock.

TABLE 4-2b
CONTROL ACTION SCREENING COMMENTS SUMMARY FOR
STREAM BASED SOURCE AREAS

General Response Action	Control Action	Process Option	Description	Screening Comment
Engineering Controls (continued)	Dredging and Disposal	Placement of dredge material or processed fines on farmland or Delta islands with control levees	Dredge sediment or excavate active floodplain deposits containing elevated concentrations of mercury. Transport non-hazardous sediment or processed fines to and place on farmland protected by levees. Establish cover crop or implement other control actions to reduce erosion of raw materials.	Removes active sediment containing mercury from stream channel and active floodplain at small to large scales. Highly effective. Easy implementablity, as whole sediment is placed directly on Delta island without processing. Placement of sediment on a levee controlled island required to control reintroduction of sediment to Delta. Requires trucking or barging of sediment to Delta island if dredging or processing of fines generation occurs outside of Delta. Timeframe to achieved load reduction is over the short to medium term depending on the scale of the dredging project. Addresses mercury contained in active stream and floodplain sediments. Provides relatively moderate to high load reduction within system, depending on mercury content and volume of sediment removed. No net impact on potential mercury methylation anticipated, other than through mercury mass reduction.
		Placement of dredge material or processed fines as fill for construction	Dredge sediment or excavate active floodplain deposits containing elevated concentrations of mercury. Transport non-hazardous sediment or processed fines for use as fill at a construction site. Implement other control actions to reduce erosion of raw materials where not under pavement or foundation.	Removes active sediment containing mercury from stream channel and active floodplain at small to large scales, though trucking costs can become prohibitive with large scale projects. Highly effective. Easy to moderate implementablity, as trucking of whole sediment or processed fines to construction site is required. Requires use of erosion controls for construction fill not under pavement or foundation to control reintroduction of sediment to Delta. Timeframe to achieved load reduction is over the short to medium term depending on the scale of the dredging project. Addresses mercury contained in active stream and floodplain sediments. Provides relatively moderate to high load reduction within system, depending on mercury content and volume of sediment removed.
		Placement of dredge material or processed fines in a solid waste landfill	Dredge sediment or excavate active floodplain deposits containing elevated concentrations of mercury. Transport non-hazardous sediment or processed fines (mercury content below 20 mg/kg) to and place in an off-site solid waste landfill.	Removes active sediment containing mercury from stream channel and active floodplain at small to large scales. Highly effective. Easy to moderate implementablity, though trucking costs can become prohibitive with large scale projects. Not cost-effective to dispose of a large volume of non-hazardous sediment or processed fines in a solid waste landfill. Timeframe to achieved load reduction is over the short to medium term depending on the scale of the dredging project. Addresses mercury contained in active stream and floodplain sediments. Provides relatively moderate to high load reduction within system, depending on mercury content and volume of sediment removed. The concentration of mercury in stream sediment has not been documented at a high enough concentration to warrant disposal in a Class III solid waste landfill; therefore, the control action will not be carried forward for further evaluation.
		Placement of dredge material or processed fines in a Class I repository	Dredge sediment or excavate active floodplain deposits containing elevated, hazardous concentrations of mercury. Transport hazardous sediment or processed fines (mercury content between 20 mg/kg and 260 mg/kg) to and place in a Class I repository for hazardous materials	Removes active sediment containing mercury from stream channel and active floodplain at small to large scales. Highly effective. Easy to moderate implementablity, though trucking costs can become prohibitive with large scale projects. Not cost-effective to dispose of a large volume of non-hazardous sediment or processed fines in a Class I hazardous waste repository. In addition, sufficient space may not be available within the repository for sediment disposal. Timeframe to achieved load reduction is over the short to medium term depending on the scale of the dredging project. Addresses mercury contained in active stream and floodplain sediments. Provides relatively moderate to high load reduction within system, depending on mercury content and volume of sediment removed. The concentration of mercury in stream sediment has not been documented at a high enough concentration to warrant disposal in a Class I hazardous waste repository; therefore, the control action will not be carried forward for further evaluation.
Dredging and Treatment of Sediment	Physical Separation	Physical separation of aggregate from fines and on- or off-site disposal of processed fines	Dredge sediment or excavate active floodplain deposits containing elevated concentrations of mercury. Mobilize sand and gravel plant setup for mercury recovery. Separate coarse material from fine materials containing mercury. Sell aggregate (coarse fraction) as a commodity. Dispose of fine materials containing mercury under other desired control action.	Removes active sediment containing mercury from stream channel and active floodplain at small to large scales. Highly effective. Easy to moderate implementablity, depending on whether aggregate processing is completed on the dredge or at a centralized facility. Placement of fine materials in a levee controlled area or managed environment required. Timeframe to achieved load reduction is over the short to medium term depending on the scale of the project. Addresses mercury contained in active stream and floodplain sediments. Provides relatively moderate to high load reduction within system, depending on mercury content and volume of sediment removed. No net impact on potential for mercury methylation anticipated, other than through overall mercury mass reduction.

TABLE 4-2b
CONTROL ACTION SCREENING COMMENTS SUMMARY FOR
STREAM BASED SOURCE AREAS

General Response Action	Control Action	Process Option	Description	Screening Comment
Dredging and Treatment of Sediment (continued)	Physical/Chemical Treatment	Physical separation of aggregate from fines and off-site retorting of processed fines	See “Physical separation of aggregate from fines” Transport fine materials containing hazardous concentrations of mercury above 260 mg/kg that cannot be disposed of in a Class I landfill, to an off-site permitted retorting facility. Retort process volatilizes mercury from processed fines by heating of material. Mercury vapor is collected, recondensed, and sold as an economic commodity.	Removes active sediment containing mercury from stream channel and active floodplain at small to large scales. Highly effective. Easy to moderate implementablity, depending on whether aggregate processing is completed on the dredge or at a centralized facility. Timeframe to achieved load reduction is over the short to medium term depending on the scale of the project. Addresses mercury contained in active stream and floodplain sediments. Provides relatively moderate to high load reduction within system, depending on mercury content and volume of sediment removed. The concentration of mercury in stream sediment has not been documented at a high enough concentration to warrant retorting; therefore, the control action will not be carried forward for further evaluation.
		Physical separation of aggregate from fines and fixation/stabilization of processed fines	See “Physical separation of aggregate from fines” Fixation/stabilization can be used as a pretreatment process to limit the leachability of mercury prior to disposal of hazardous fine materials in an off-site waste repository (addresses leachability concern for disposal in Class II landfill). Uses solidifying/ stabilizing agents in conjunction with mixing techniques to facilitate a physical or chemical change in mobility of the mercury.	Removes active sediment containing mercury from stream channel and active floodplain at small to large scales. Highly effective. Easy to moderate implementablity, depending on whether aggregate processing is completed on the dredge or at a centralized facility. Timeframe to achieved load reduction is over the short to medium term depending on the scale of the project. Addresses mercury contained in active stream and floodplain sediments. Provides relatively moderate to high load reduction within system, depending on mercury content and volume of sediment removed. The concentration of mercury in stream sediment has not been documented at a high enough concentration for classification as a hazardous material or as a threat to water quality; therefore, fixation/stabilization is not necessary and the control action will not be carried forward for further evaluation.
		Physical separation of aggregate from fines and soil washing of processed fines	See “Physical separation of aggregate from fines” Soil washing would be used to separate metals from processed fine materials via dissolution in a heap, vat, or agitated vessel followed by precipitation in a separate vessel.	Removes active sediment containing mercury from stream channel and active floodplain at small to large scales. Highly effective. Easy to moderate implementablity, depending on whether aggregate processing is completed on the dredge or at a centralized facility. Timeframe to achieved load reduction is over the short to medium term depending on the scale of the project. Addresses mercury contained in active stream and floodplain sediments. Provides relatively moderate to high load reduction within system, depending on mercury content and volume of sediment removed. The concentration of mercury in stream sediment has not been documented at a high enough concentration for classification as a hazardous material or as a threat to water quality; therefore, washing of fine materials is not necessary and the control action will not be carried forward for further evaluation.

Note: Eliminated control actions and/or process options are shaded.
mg/kg = milligram per kilogram

TABLE 4-3a
RETAINED LOAD REDUCTION ALTERNATIVES FOR
LAND BASED SOURCE AREAS

Alternative	Description
1	No action
2	Institute land use restrictions and ensure implementation of existing BMPs to limit practices that may disturb soils with elevated levels of mercury
3	Grade, revegetate, and install run-on and run-off controls/diversions for intact mine waste or soils with elevated levels of mercury
4	Consolidate non-hazardous mine waste and/or basin sediment, revegetate, and install run-on and run-off controls
5	Place an earthen cover over intact or consolidated mine waste and/or basin sediment, revegetate, and install run-on and run-off controls
6	Excavation, process aggregate as a commodity, and on- or off-site disposal of non-hazardous fines
7	Excavation, process aggregate as a commodity, and on-site fixation/stabilization of hazardous fines
8	Excavation, process aggregate as a commodity, and placement of hazardous fines in an on-site mine waste repository or an off-site Class I repository
9	Excavation, process aggregate as a commodity, and off-site retorting of hazardous fines
10	Construct check dams and settling basins to capture solids eroding from mine site
11	Install in channel erosion and flood controls; construct setback levees to isolate mine waste from streams

TABLE 4-3b
RETAINED LOAD REDUCTION ALTERNATIVES FOR STREAM BASED SOURCE AREAS

Alternative	Description
1	No action
2	Ensure implementation of existing programs; coordinate flood control operations, water transfers, and irrigation management; and improve levee and control structure maintenance activities
3	Modify existing sediment control structures to improve capture efficiency
4	Stabilize stream banks, flood plains, and settling basin surfaces
5	Construct flood control bypasses and/or settling basins to promote solids settling
6	Construct levees to isolate mercury and mine waste contained in floodplain sediment from adjacent active stream channel
7	Capture sediment using low dams and weirs within small creeks and streams
8	Dredge, process aggregate as a commodity, and dispose of fines (farmland, Delta islands, construction sites)

TABLE 5-1a
ENGINEERING EVALUATION SUMMARY FOR RETAINED LAND BASED LOAD REDUCTION ALTERNATIVES

		Project Area Type																	
		Upstream hydraulic and hard rock mines			Upstream mercury mines			Active channel (ephemeral streams)			Active floodplain (ephemeral streams)			Eroding stream banks			Historic floodplain		
Alternative	**Description**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**
1	No action	3	1	1	3	1	1	3	1	1	3	1	1	3	1	1	3	1	1
2	Institute land use restrictions and ensure implementation of existing BMPs to limit practices that may disturb soils with elevated levels of mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3	1	1	2	1	1
3	Grade, revegetate, and install run-on and run-off controls/diversions for intact mine waste or soils with elevated levels of mercury	2-3	1	1	2-3	1	1	NA	NA	NA	2-3	1	1-2	2	1	1	3	1	2
4	Consolidate non-hazardous mine waste and/or basin sediment, revegetate, and install run-on and run-off controls	2	1-2	1-2	2	1-2	1-2	2	2	2	2	2	2	NA	NA	NA	NA	NA	NA
5	Place an earthen cover over intact or consolidated mine waste and/or basin sediment, revegetate, and install run-on and run-off controls	2	1	2	2	1	2	3	3	2	2	2	2	NA	NA	NA	NA	NA	NA
6	Excavation, process aggregate as a commodity, and on- or off-site disposal of non-hazardous fines	1	2	2-3	1	2	2-3	1	2	2-3	1	2	3	NA	NA	NA	NA	NA	NA
7	Excavation, process aggregate as a commodity, and on-site fixation/stabilization of hazardous fines	1	2	2-3	1	2	2-3	1	2	2-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	Excavation, process aggregate as a commodity, and placement of hazardous fines in an off-site Class I repository	1	1	3	1	1	3	1	2	3	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	Excavation, process aggregate as a commodity, and off-site retorting of hazardous fines	1	1	3	1	1	3	1	2	3	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	Construct check dams and settling basins to capture solids eroding from mine site	2	2	2	2	2	2	2	2	2	3	2	2	2	1	2	NA	NA	NA
11	Install in channel erosion and flood controls; construct setback levees to isolate mine waste from streams	2	2	2	2	2	2	1-2	1	2	2	2	1	3	1-2	1-2	2	1-2	2-3

E = Effectiveness
I = Implementability
C = Relative Cost

Score of 1 means highly effective, readily implementable, low cost
Score of 2 means moderately effective, moderate level of difficulty to implement, moderate cost
Score of 3 means limited effectiveness, difficult to implement, high cost

Grey shading means alternative is not applicable at a project area

TABLE 5-1b
ENGINEERING EVALUATION SUMMARY FOR RETAINED STREAM BASED LOAD REDUCTION ALTERNATIVES

		Project Area Type																							
		Active channel			Active floodplain			Eroding stream banks			Historic floodplain			Flood control bypasses/basins			Delta islands and marshlands			Reservoirs			Hydraulic and hard rock mines		
Alternative	**Description**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**
1	No action	3	1	1	3	1	1	3	1	1	3	1	1	3	1	1	3	1	1	3	1	1	3	1	1
2	Ensure implementation of existing programs; coordinate flood control operations, water transfers, and irrigation management; and improve levee and sediment control structure maintenance activities	2	1	1	2	1	1	2	1	1				2	1	1	2	1	1	2	1	1			
3	Modify existing sediment control structures to improve capture efficiency	2	1	2	2	1	2							2	1	2	2	1	2				2	1	2
4	Stabilize stream banks, floodplains, and settling basin surfaces				2	1	2	2	2	2	2	1	2	2	1	2	2	1	2				2	1	2
5	Construct flood control bypasses and/or settling basins to promote solids settling	1	2	3	1	2	3							1	2	3							1	2	3
6	Construct levees to isolate mercury and mine waste contained in floodplain sediment from adjacent active stream channel				2	2	3	2	2	3	2	2	3												
7	Capture sediment using low dams and weirs within small creeks and streams	2	3	2	2	3	2	2	3	2	2	3	2										2	2	2
8	Dredge, process aggregate as a commodity, and dispose of fines (farmland, Delta islands, construction sites)	1	2	3	1	2	3							1	2	3				1	2	3			

E = Effectiveness
I = Implementability
C = Relative Cost

Score of 1 means highly effective, readily implementable, low cost
Score of 2 means moderately effective, moderate level of difficulty to implement, moderate cost
Score of 3 means limited effectiveness, difficult to implement, high cost

Grey shading means alternative is not applicable at a project area

TABLE 6-1a
COMPARATIVE EVALUATION OF LOAD REDUCTION ALTERNATIVES FOR
LAND BASED PROJECT AREAS

		Retained Project Areas											
		Mercury Mines in Sulphur Creek Watershed			Floodplain Containing Mine Waste on Sulphur Creek			Floodplain Containing Mine Waste on Bear Creek			Floodplain Containing Mine Waste on Harley Gulch		
Alternative	**Description**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**
1	No action												
2	Institute land use restrictions and ensure implementation of existing BMPs to limit practices that may disturb soils with elevated levels of mercury				3	1	1	3	1	1	3	1	1
3	Grade, revegetate, and install run-on and runoff controls/diversions for intact mine waste or soils with elevated levels of mercury	2-3	1-2	1-2	2	2	2	2-3	2	2	3	1	1-2
4	Consolidate non-hazardous mine waste and/or basin sediment, revegetate, and install run-on and runoff controls	2	1-2	1-2							1-2	2	3
5	Place an earthen cover over intact or consolidated mine waste and/or basin sediment, revegetate, and install run-on and runoff controls	2	1-2	2							1	2	3
6	Excavation, process aggregate as a commodity, and on- or off-site disposal of non-hazardous fines										1	2	3
7	Excavation, process aggregate as a commodity, and on-site fixation/stabilization of hazardous fines	1-2	3	2-3									
8	Excavation, process aggregate as a commodity, and placement of hazardous fines in an on-site mine waste repository or off-site Class I repository	1	2-3	3									
9	Excavation, process aggregate as a commodity, and off-site retorting of hazardous fines												
10	Construct check dams and settling basins to capture solids eroding from mine site	2	2-3	3	2	2-3	2-3	2	2-3	3	2	2	2
11	Install in channel erosion and flood controls; construct setback levees to isolate mine waste from streams				2-3	2-3	3				1-2	2	3

E = Effectiveness
I = Implementability
C = Relative Cost

Score of 1 means highly effective, readily implementable, low cost
Score of 2 means moderately effective, moderate level of difficulty to implement, moderate cost
Score of 3 means limited effectiveness, difficult to implement, high cost

Grey shading means alternative is not applicable at a project area

TABLE 6-1b
COMPARATIVE EVALUATION OF LOAD REDUCTION ALTERNATIVES FOR STREAM BASED PROJECT AREAS
(Page 1 of 2)

		Retain Project Areas																	
		South Fork Yuba River at Englebright Reservoir			Active Channel and Floodplain of Yuba River within the Yuba Goldfields			Active Channel and Floodplain of Feather River near confluence with Yuba River			Active Channel and Floodplain of Feather River near confluence with Bear River			Active Channel and Floodplain of Feather River from Nicolaus to Verona			Active Channel and Floodplain of Sacramento River upstream of Feather River		
Alternative	**Description**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**
1	No action																		
2	Ensure implementation of existing programs; coordinate flood control operations, water transfers, and irrigation management; and improve levee and control structure maintenance activities	2-3	2	1	2-3	2	2-3	3	2	1	3	2	1	3	2	1	3	2	1
3	Modify existing sediment control structures to improve capture efficiency																		
4	Stabilize stream banks, flood plains, and settling basin surfaces				2	2	3	2	2	2	2-3	2	2	2	2	2			
5	Construct flood control bypasses and/or settling basins to promote solids settling				1-2	3	3												
6	Construct levees to isolate mercury and mine waste contained in floodplain sediment from adjacent active stream channel				1-2	3	3												
7	Capture sediment using low dams and weirs within small creeks and streams										2	2	2						
8	Dredge, process aggregate as a commodity, and dispose of fines (farmland, Delta islands, construction sites)	2	2	3	2	2	3	1	2	2-3	1	2	3	1	2	2	1	2	1-2

E = Effectiveness
I = Implementability
C = Relative Cost

Score of 1 means highly effective, readily implementable, low cost
Score of 2 means moderately effective, moderate level of difficulty to implement, moderate cost
Score of 3 means limited effectiveness, difficult to implement, high cost

Grey shading means alternative is not applicable at a project area

TABLE 6-1b
COMPARATIVE EVALUATION OF LOAD REDUCTION ALTERNATIVES FOR STREAM BASED PROJECT AREAS
(Page 2 of 2)

		Retain Project Areas														
		Active Channel and Floodplain on Lower Cache Creek from Capay to Yolo			Cache Creek Settling Basin			Yolo Bypass from Fremont Weir to Putah Creek			Lower Putah Creek Upstream of Yolo Bypass			Active Channel and Floodplain of Sacramento River from Verona to Freeport		
Alternative	**Description**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**	**E**	**I**	**C**
1	No action															
2	Ensure implementation of existing programs; coordinate flood control operations, water transfers, and irrigation management; and improve levee and control structure maintenance activities							2-3	2	2	2-3	2	1	3	2	1
3	Modify existing sediment control structures to improve capture efficiency				1-2	2	2-3	2	2	2-3	2	2	2			
4	Stabilize stream banks, flood plains, and settling basin surfaces	2	2	2-3	2	1	1	3	1	1	3	1	1			
5	Construct flood control bypasses and/or settling basins to promote solids settling	1-2	3	3												
6	Construct levees to isolate mercury and mine waste contained in floodplain sediment from adjacent active stream channel	2	3	3												
7	Capture sediment using low dams and weirs within small creeks and streams	1-2	2-3	3							2	2	2			
8	Dredge, process aggregate as a commodity, and dispose of fines (farmland, Delta islands, construction sites)	1	2	3	1-2	2	3							1	2	3

E = Effectiveness
I = Implementability
C = Relative Cost

Score of 1 means highly effective, readily implementable, low cost
Score of 2 means moderately effective, moderate level of difficulty to implement, moderate cost
Score of 3 means limited effectiveness, difficult to implement, high cost

Grey shading means alternative is not applicable at a project area

TABLE 6-2a
COMPARATIVE ANALYSIS OF COSTS FOR MERCURY MINES IN THE SULPHUR CREEK WATERSHED

	West End Mercury Mine				Manzanita Mercury Mine				Elgin Mercury Mine			
Alternative	Projected Cost	Projected Load Reduction	Cost Efficiency	Reference Table	Projected Cost	Projected Load Reduction	Cost Efficiency	Reference Table	Projected Cost	Projected Load Reduction	Cost Efficiency	Reference Table
1												
2												
3					$118,411	2.3 kg/yr @35%	$51,483/kg/yr	A-L3-2	$56,305	3.3 kg/yr @35%	$17,062/kg/yr	A-L3-1
4	$177,311	0.6 kg/yr @50%	$295,518/kg/yr	A-L4-2					$101,248	4.7 kg/yr @50%	$21,542/kg/yr	A-L4-1
5	$424,907	0.6 kg/yr @50%	$708,178/kg/yr	A-L5-2					$392,538	4.7 kg/yr @50%	$83,519/kg/yr	A-L5-1
6												
7	$350,146	0.8 kg/yr @70%	$437,682/kg/yr	A-L7-2					$293,518	6.5 kg/yr @70%	$45,157/kg/yr	A-L7-1
8	**$426,131**	**1.1 kg/yr @100%**	**$387,392/kg/yr**	**A-L8-3**	**$153,267**	**3.3 kg/yr @50%**	**$46,445/kg/yr**	**A-L8-2**	**$378,668**	**9.3 kg/yr @100%**	**$40,717/kg/yr**	**A-L8-1**
9												
10					$120,974	3.3 kg/yr @50%	$36,659/kg/yr	A-L10-2	$276,352	4.7 kg/yr @50%	$58,798/kg/yr	A-L10-1
11												

Notes:

Cost summaries are provided in Appendix A under the listed reference table

West End Mine Mercury Load is 1.1 kg/yr
Manzanita Mine Mercury Load is 6.5 kg/yr
Elgin Mine Mercury Load is 9.3 kg/yr

TABLE 6-2b
COMPARATIVE ANALYSIS OF COSTS
FLOODPLAIN CONTAINING MINE WASTE ON SULPHUR CREEK

	Sulphur Creek Floodplain			
Alternative	**Projected Cost**	**Projected Load Reduction**	**Cost Efficiency**	**Reference Table**
1				
2	$234,404	1.6 kg/yr@15%	$146,503/kg/yr	A-L2-1
3	**$286,256**	**5.3 kg/yr@50%**	**$54,011/kg/yr**	**A-L3-3**
4				
5				
6				
7				
8				
9				
10	$1,207,102	5.3 kg/yr@50%	$227,755/kg/yr	A-L10-3
11	$1,757,601	3.7 kg/yr@35%	$475,027/kg/yr	A-L11-1

Notes:

Cost summaries are provided in Appendix A under the listed reference table

Sulphur Creek Floodplain Mercury Load is 10.5 kg/yr
Estimate is based on mobile load and does not account for large mass of mercury in floodplain

TABLE 6-2c
COMPARATIVE ANALYSIS OF COSTS
FLOODPLAIN CONTAINING MINE WASTE ON BEAR CREEK

	Bear Creek Floodplain			
Alternative	**Projected Cost**	**Projected Load Reduction**	**Cost Efficiency**	**Reference Table**
1				
2	$234,404	2 kg/yr@15%	$117,202/kg/yr	A-L2-2
3	**$338,616**	**4.7 kg/yr@35%**	**$72,046/kg/yr**	**A-L3-4**
4				
5				
6				
7				
8				
9				
10	$1,790,921	6.8 kg/yr@50%	$263,371/kg/yr	A-L10-4
11				

Notes:

Cost summaries are provided in Appendix A under the listed reference table

Bear Creek Floodplain Mercury Load is 13.5 kg/yr
Estimate is based on mobile load and does not account for large mass of mercury in floodplain

TABLE 6-2d
COMPARATIVE ANALYSIS OF COSTS
FLOODPLAIN CONTAINING MINE WASTE ON HARLEY GULCH

	Harley Gulch Floodplain			
Alternative	**Projected Cost**	**Projected Load Reduction**	**Cost Efficiency**	**Reference Table**
1				
2	$234,404	1 kg/yr@15%	$234,404/kg/yr	A-L2-3
3	$149,996	1 kg/yr@15%	$149,996/kg/yr	A-L3-5
4	$2,351,060	4.9 kg/yr@70%	$479,808/kg/yr	A-L4-3
5	$2,641,969	7 kg/yr@100%	$377,424/kg/yr	A-L5-3
6	$2,702,060	7 kg/yr@100%	$386,006/kg/yr	A-L6-1
7				
8				
9				
10	**$861,905**	**3.5 kg/yr@50%**	**$246,259/kg/yr**	**A-L10-5**
11	$2,074,469	4.9 kg/yr@35%	$423,361kg/yr	A-L11-2

Notes:

Cost summaries are provided in Appendix A under the listed reference table

Harley Gulch Floodplain Mercury Load is 7 kg/yr
Estimate is based on mobile load and does not account for large mass of mercury in floodplain

TABLE 6-3a
COMPARATIVE ANALYSIS OF COSTS
SOUTH FORK YUBA RIVER AT ENGLEBRIGHT RESERVOIR

Alternative	South Fork Yuba River at Englebright Reservoir			
	Projected Cost	**Projected Load Reduction**	**Cost Efficiency**	**Reference Table**
1				
2	**$2,740,221**	**3.9 kg/yr@35%**	**$702,621/kg/yr**	**A-S2-1**
3				
4				
5				
6				
7				
8	$115,365,839	5.5 kg/yr@50%	$20,975,607/kg/yr	A-S8-1

Notes:

Cost summaries are provided in Appendix A under the listed reference table

Englebright Mercury Load is 11 kg/yr
Estimate is based on 25% (75% settling efficiency) of Yuba River load 43 kg/yr

TABLE 6-3b
COMPARATIVE ANALYSIS OF COSTS
ACTIVE CHANNEL AND FLOODPLAIN OF YUBA RIVER WITHIN THE YUBA GOLDFIELDS

	Active Channel and Floodplain of Yuba River within the Yuba Goldfields			
Alternative	**Projected Cost**	**Projected Load Reduction**	**Cost Efficiency**	**Reference Table**
1				
2	**$6,846,241**	**4.8 kg/yr@35%**	**$1,426,300/kg/yr**	**A-S2-2**
3				
4	**$62,859,209**	**16 kg/yr@50%**	**$3,928,701/kg/yr**	**A-S4-1**
5	$150,528,938	22.4 kg/yr@70%	$6,720,042/kg/yr	A-S5-1
6	$185,877,016	22.4 kg/yr@70%	$8,298,081/kg/yr	A-S6-1
7				
8	$131,679,261	16 kg/yr@50%	$8,229,954/kg/yr	A-S8-2

Notes:

Cost summaries are provided in Appendix A under the listed reference table

Yuba River Mercury Load is 32 kg/yr after removing assumed load from Englebright Reservoir
Estimate is based on mobile load and does not account for large mass of mercury in floodplain and channel

TABLE 6-3c
COMPARATIVE ANALYSIS OF COSTS
ACTIVE CHANNEL AND FLOODPLAIN OF FEATHER RIVER
NEAR CONFLUENCE WITH YUBA RIVER

	Active Channel and Floodplain of Feather River Near Confluence with Yuba River			
Alternative	**Projected Cost**	**Projected Load Reduction**	**Cost Efficiency**	**Reference Table**
1				
2	$5,740,309	2 kg/yr@15%	$2,870,155/kg/yr	A-S2-3
3				
4	**$8,197,024**	**6.5 kg/yr@50%**	**$1,261,081/kg/yr**	**A-S4-2**
5				
6				
7				
8	$45,539,160	11.1 kg/yr@85%	$4,102,627/kg/yr	A-S8-3

Notes:

Cost summaries are provided in Appendix A under the listed reference table

Mercury Load is 13 kg/yr, assuming just resuspension of channel load
Estimate is based on mobile load and does not account for large mass of mercury in floodplain and channel

TABLE 6-3d
COMPARATIVE ANALYSIS OF COSTS
ACTIVE CHANNEL AND FLOODPLAIN OF FEATHER RIVER
NEAR CONFLUENCE WITH BEAR RIVER

	Active Channel and Floodplain of Feather River Near Confluence with Bear River			
Alternative	**Projected Cost**	**Projected Load Reduction**	**Cost Efficiency**	**Reference Table**
1				
2	$8,343,030	1.4 kg/yr@15%	$5,959,307/kg/yr	A-S2-4
3				
4	**$15,302,559**	**3.2 kg/yr@35%**	**$4,782,050/kg/yr**	**A-S4-3**
5				
6				
7	$7,635,228	4.5 kg/yr@50%	$1,696,717/kg/yr	A-S7-1
8	$122,397,900	6.3 kg/yr@70%	$19,428,238/kg/yr	A-S8-4

Notes:

Cost summaries are provided in Appendix A under the listed reference table

Mercury Load is 9 kg/yr, based on extra load picked up from Bear River
Estimate is based on mobile load and does not account for large mass of mercury in floodplain and channel

TABLE 6-3e
COMPARATIVE ANALYSIS OF COSTS
ACTIVE CHANNEL AND FLOODPLAIN OF FEATHER RIVER
FROM NICOLAUS TO VERONA

	Active Channel and Floodplain of Feather River from Nicolaus to Verona			
Alternative	**Projected Cost**	**Projected Load Reduction**	**Cost Efficiency**	**Reference Table**
1				
2	$10,071,381	2 kg/yr@15%	$5,035,691/kg/yr	A-S2-5
3				
4	**$21,041,487**	**6.5 kg/yr@50%**	**$3,237,152/kg/yr**	**A-S4-4**
5				
6				
7				
8	$255,515,460	11.1 kg/yr@85%	$23,019,411/kg/yr	A-S8-5

Notes:

Cost summaries are provided in Appendix A under the listed reference table

Mercury Load is 13 kg/yr, assuming just resuspension of channel load similar to upstream reach
Estimate is based on mobile load and does not account for large mass of mercury in floodplain and channel

TABLE 6-3f
COMPARATIVE ANALYSIS OF COSTS
ACTIVE CHANNEL AND FLOODPLAIN OF SACRAMENTO RIVER UPSTREAM OF FEATHER RIVER

	Active Channel and Floodplain of Sacramento River Upstream of Feather River			
Alternative	**Projected Cost**	**Projected Load Reduction**	**Cost Efficiency**	**Reference Table**
1				
2	**$18,115,267**	**20.7 kg/yr @15%**	**$875,134/kg/yr**	**A-S2-6**
3				
4				
5				
6				
7				
8	$30,922,922	25.5 kg/yr @85%	$1,212,664/kg/yr	A-S8-6

Notes:

Cost summaries are provided in Appendix A under the listed reference table

Mercury Load is 30 kg/yr and assumes flushing of channel load derived from Sutter Bypass overflow. Estimate is based on mobile load and does not account for large mass of mercury in floodplain and channel

TABLE 6-3g
COMPARATIVE ANALYSIS OF COSTS
ACTIVE CHANNEL AND FLOODPLAIN OF LOWER CACHE CREEK
FROM CAPAY TO YOLO

Alternative	Active Channel and Floodplain of Lower Cache Creek from Capay to Yolo			
	Projected Cost	**Projected Load Reduction**	**Cost Efficiency**	**Reference Table**
1				
2				
3				
4	**$42,911,532**	**78 kg/yr@35%**	**$550,148/kg/yr**	**A-S4-5**
5	$271,605,365	112 kg/yr@50%	$2,425,048/kg/yr	A-S5-2
6	$278,947,082	78 kg/yr@35%	$3,576,245/kg/yr	A-S6-2
7	$128,983,086	112 kg/yr@50%	$1,151,635/kg/yr	A-S7-2
8	$464,304,478	157 kg/yr@70%	$2,957,353/kg/yr	A-S8-7

Notes:

Cost summaries are provided in Appendix A under the listed reference table

Lower Cache Creek Mercury Load is 224 kg/yr
Estimate is based on mobile load and does not account for large mass of mercury in floodplain and channel